

**Module description: Algebra and Statistics 1**

<b>Module Code</b>	t.BA.XXM6.AS1.19HS
<b>ECTS Credits</b>	4
<b>Language of Instruction/Examination</b>	German
<b>Organizational Unit</b>	IAMP
<b>Module Coordinator</b>	Ines Stassen Böhlen
<b>Legal Framework</b>	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
<b>Module Characteristic</b>	Type 2b  2 times 2 lecture lessons (not necessarily consecutive) per semester week and class
<b>Module Description</b>	This module covers the topics of linear equations, matrix algebra and vector geometry as well as elementary probability theory and discrete random variables.
<b>Module Content</b>	<ul style="list-style-type: none"><li>• Systems of linear equations</li><li>• Matrix algebra</li><li>• Vector geometry</li><li>• Elementary probability theory</li><li>• Discrete random variables</li></ul>
<b>Prerequisite Knowledge</b>	Mathematics of the technical vocational baccalaureate.

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Learning Objectives (Competences)	Students...	Competencies	Taxonomies			
	You become acquainted with the mathematical tools and concepts required for the engineering modules. You familiarize yourself with the mathematical way of thinking and practice your ability to abstract.	F, M	K4, K5			
	You are able to - determine the solution set of a system of linear equations. - determine the number of solutions of a given system of linear equations using suitable criteria.	M, F	K2, K3			
	You are able to - calculate the sum, product, transpose, inverse and determinant of given matrices.- determine whether a square matrix is invertible, i.e. whether its columns are linearly independent using suitable criteria.	F, M	K2, K3			
	You are able to - calculate the sum, a certain linear combination, the dot and cross products of given vectors. - describe lines, planes, circles and spheres using equations. - determine intersections of lines, planes, circles and spheres. - determine whether two given vectors are orthogonal or collinear using suitable criteria.	F, M	K2, K3			
	You are able to - define probability distributions for discrete event spaces and calculate probabilities of events. - build basic stochastic models, define random variables, derive their probability density functions (PDFs) and their cumulative distribution functions (CDFs) and calculate probabilities. - explain the meaning of measures of center and variability for random variables. - calculate the expected value, the variance and the standard deviation of discrete random variables. - calculate conditional probabilities.- build event tree diagrams. - formulate and apply Bayes' theorem, the theorem of total probability and the multiplication theorem for event tree diagrams.	M, F	K2, K3			
	You are able to use the competencies listed above to solve more complex problems.	M, F	K3			
Performance Assessment						
	End-of-module exam	Assessment	Length (min.)	Weighting	Form	
	written exam	Grade	90	70	acc. to module agreement	
	Performance assessment during the semester		Assessment	Length (min.)	Weighting	Form
	written exam		Grade	45	20	acc. to module agreement
	Moodle quizzes <i>Weekly</i>		Grade		10	acc. to module agreement
Classroom Attendance Requirement	None					

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<b>Learning material</b>	<ul style="list-style-type: none"><li>• Sachs, M. (2021). Wahrscheinlichkeitsrechnung und Statistik. 6 Edition. München: Carl Hanser Verlag. ISBN 978-3446469433.</li><li>• Gramlich, G. (2021). Lineare Algebra – Eine Einführung. 5 Edition. München: Carl Hanser Verlag. ISBN 978-3446471887.</li><li>• Papula, L. (2017). Mathematische Formelsammlung: Für Ingenieure und Naturwissenschaftler. 12 Edition. Wiesbaden: Springer Vieweg. ISBN 978-3658161941.</li></ul>
<b>Comments</b>	